HOM Analysis and Measurements of SSR1

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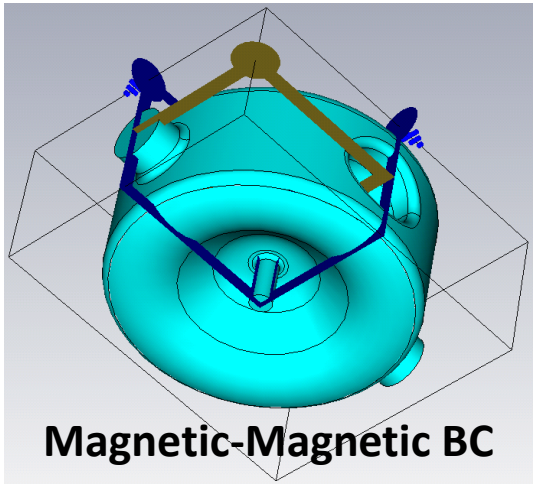
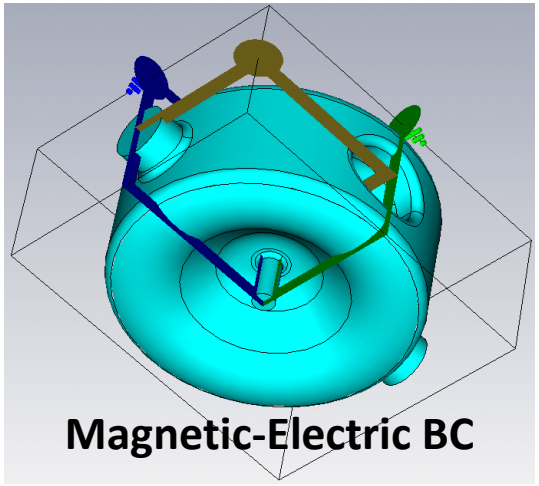
HOMs Analysis

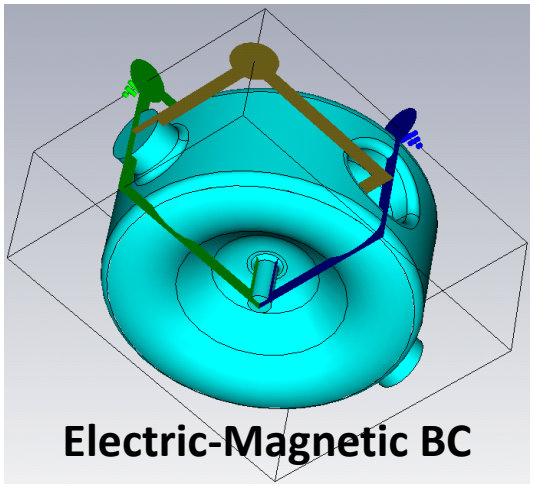
Monopoles



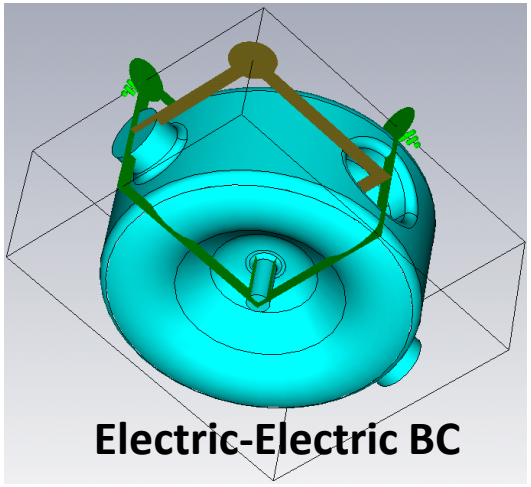
Dipoles



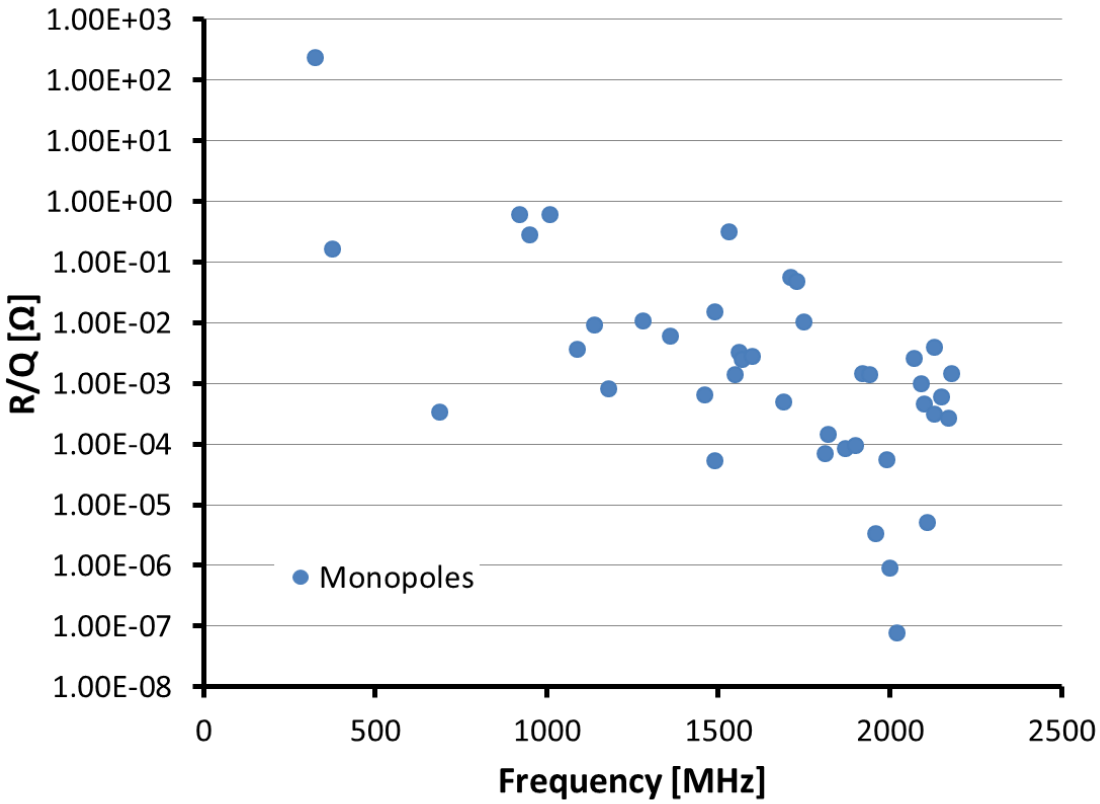
Dipoles



Quadrupoles

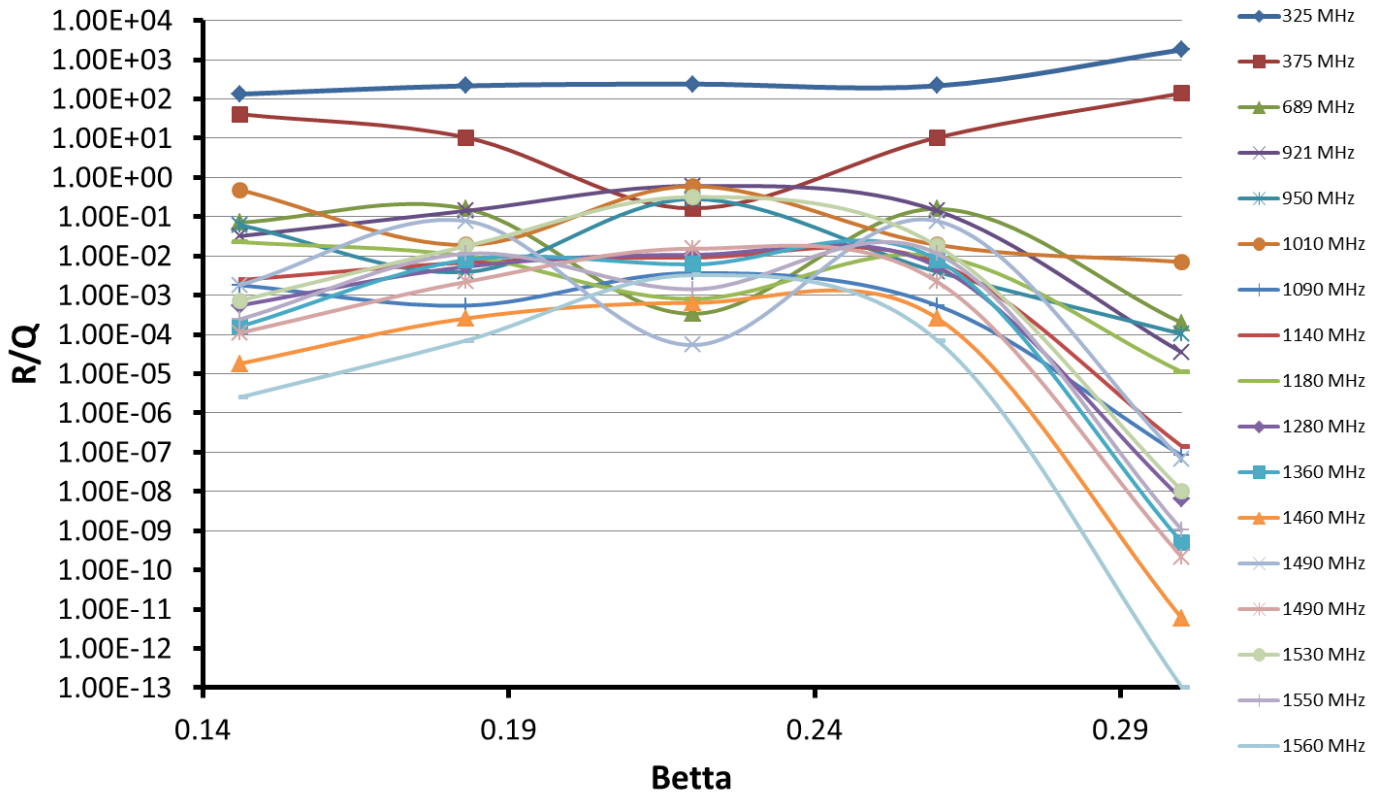


Simulated R/Q of Monopoles



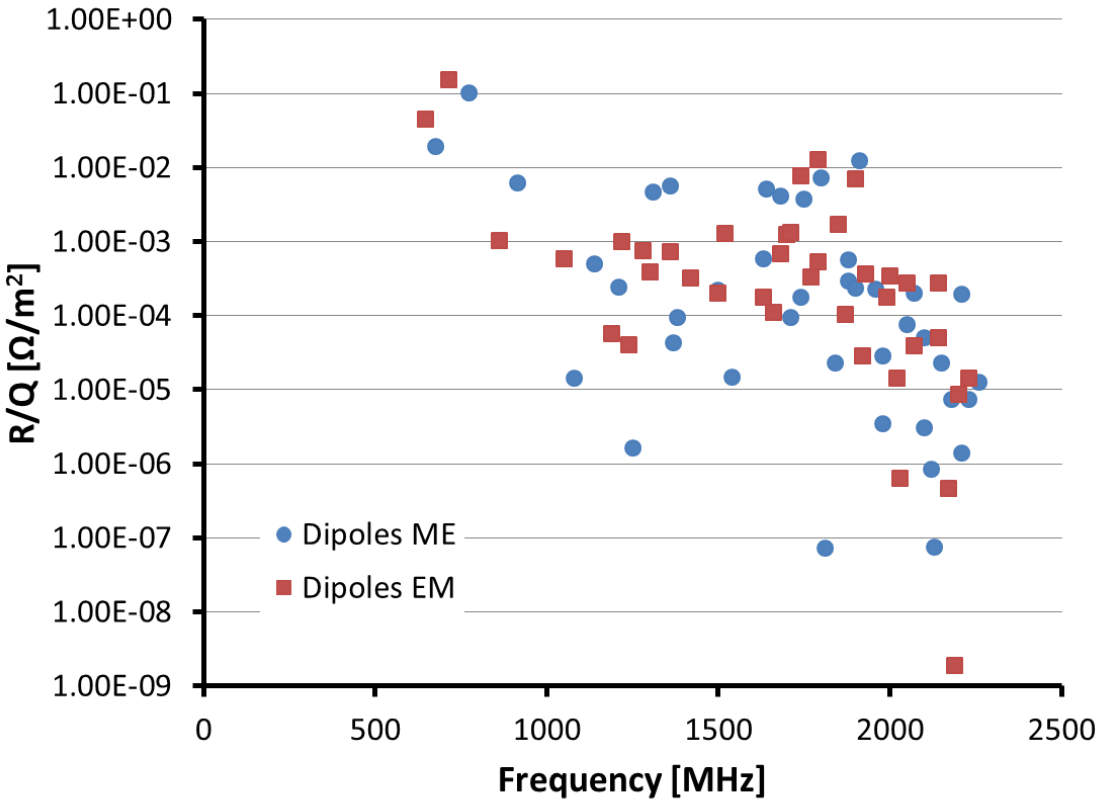
- R/Q of the fundamental mode is 239 Ω
- All R/Q of HOM monopoles are < 1 Ω (largest is 921 MHz being 0.61 Ω)

Simulated R/Q of Monopoles vs. β



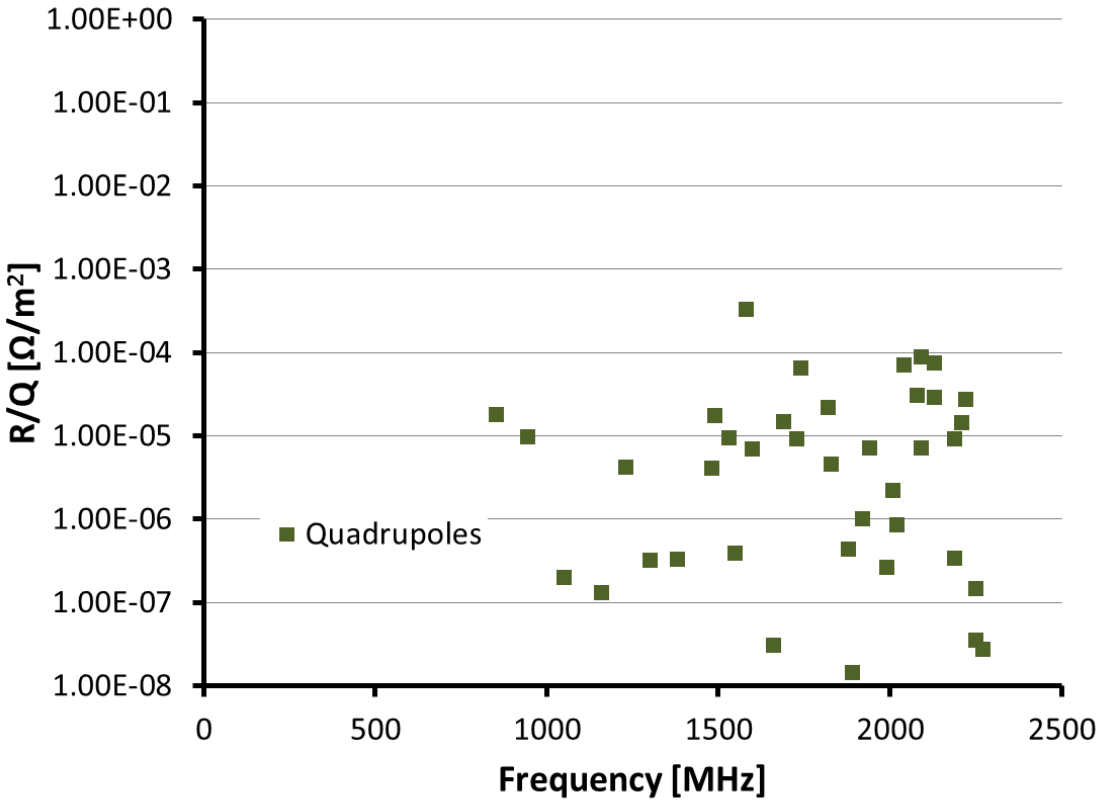
- All of the HOM monopoles are < 1 Ω in R/Q over the β range from 0.14 to 0.3 except the zero mode at 375 MHz which has R/Q over 100 Ω at β=0.3

Simulated R/Q of Dipoles



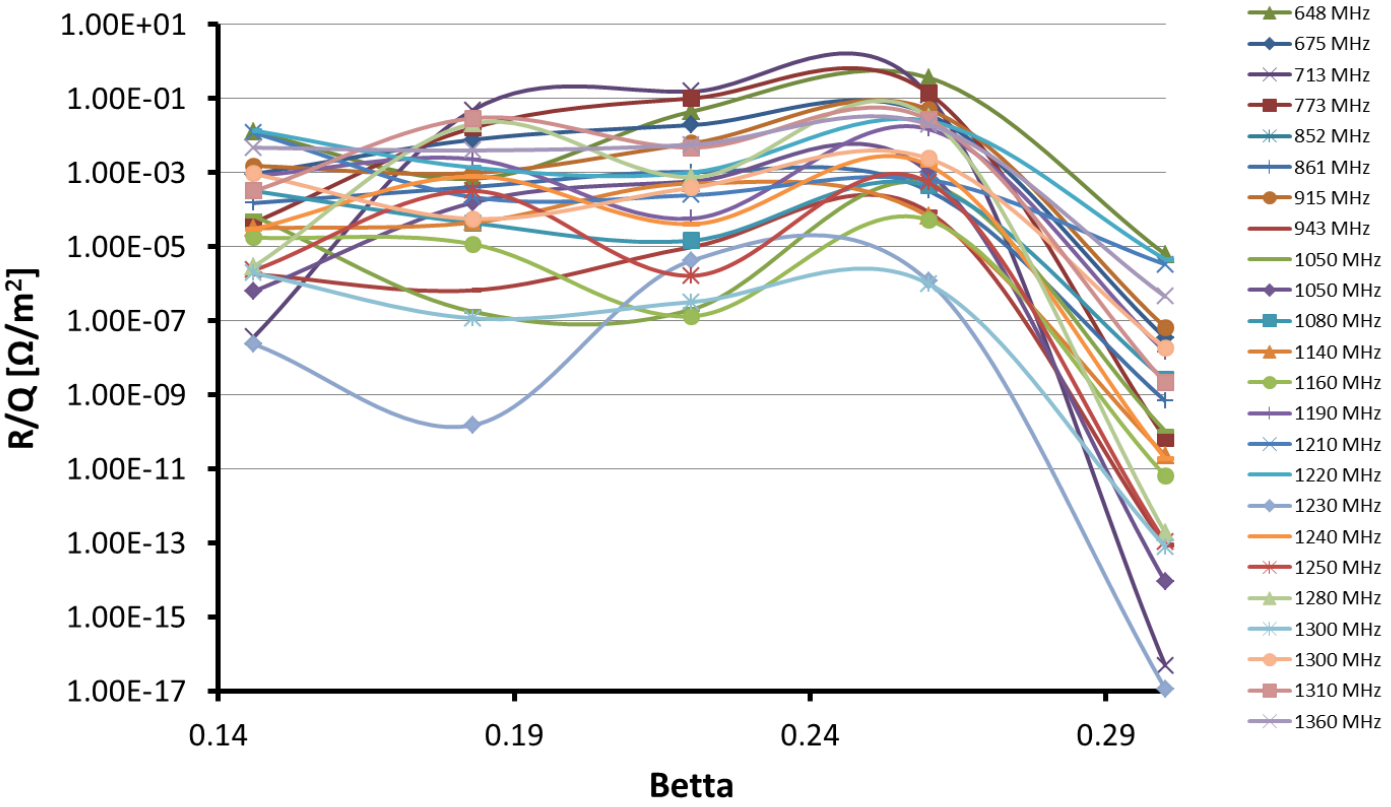
- All of the HOM dipoles are < 0.2 Ω/m^2 in R/Q with the largest mode being Dipole EM at 713 MHz with R/Q equals 0.15 Ω/m^2

Simulated R/Q of Quadrupoles



- All of the HOM quadrupoles are < 0.001 Ω/m^2 in R/Q with the largest mode being at 1580 MHz with R/Q equals 0.00033 Ω/m^2

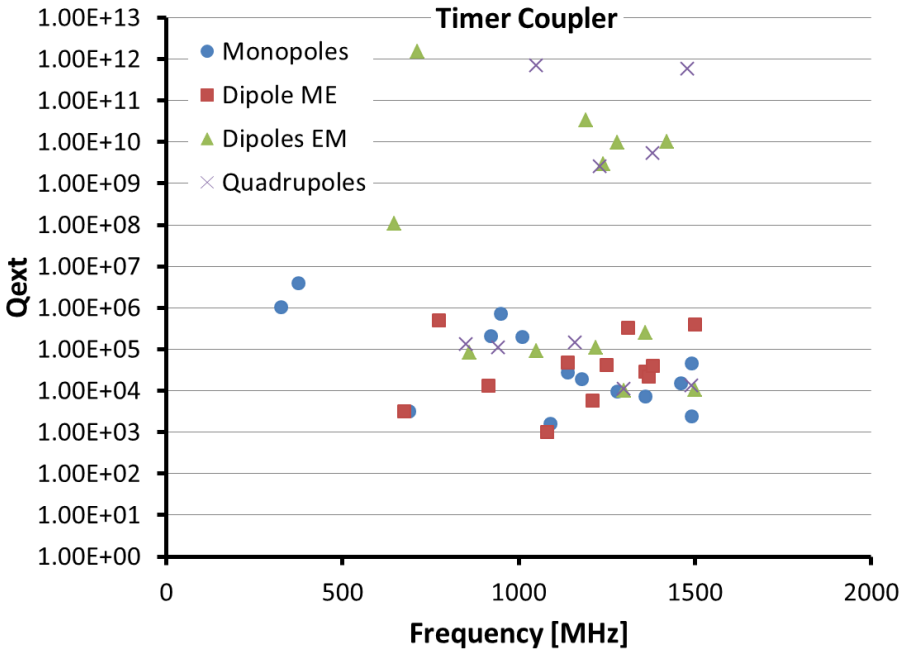
Simulated R/Q of Dipoles and Quadrupoles and vs. β



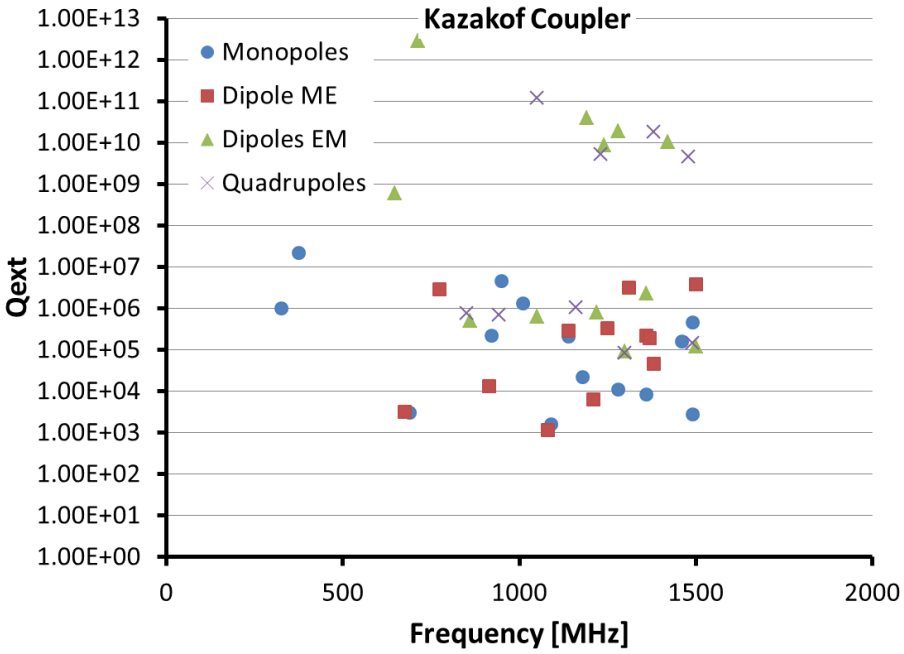
- All of the HOM dipoles and quadrupoles are < 1 Ω/m² in R/Q over the β range from 0.14 to 0.3 with the largest being the 713 MHz dipole EM mode

Q_{ext} of the different modes

33.4 mm inner cond diameter, 50Ω



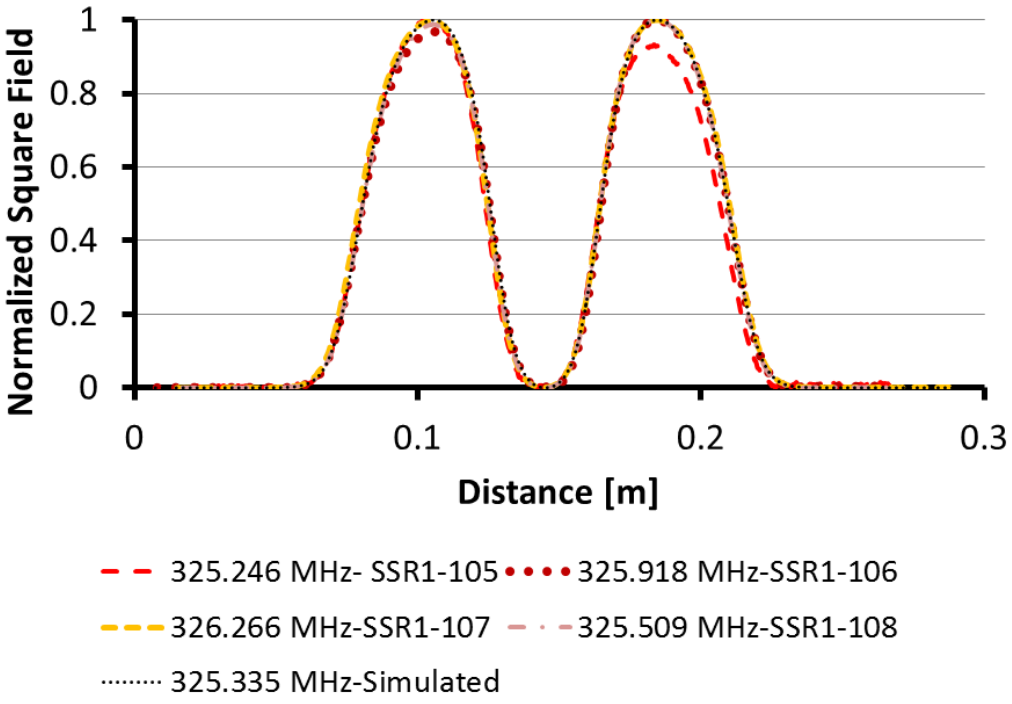
12.7 mm inner cond diameter, 105Ω



- Couplers probe antennas are designed to have Q_{ext} of the fundamental mode 1e6
- Largest Q_{ext} is that of the dipole EM mode at 713 MHz being ~1e12

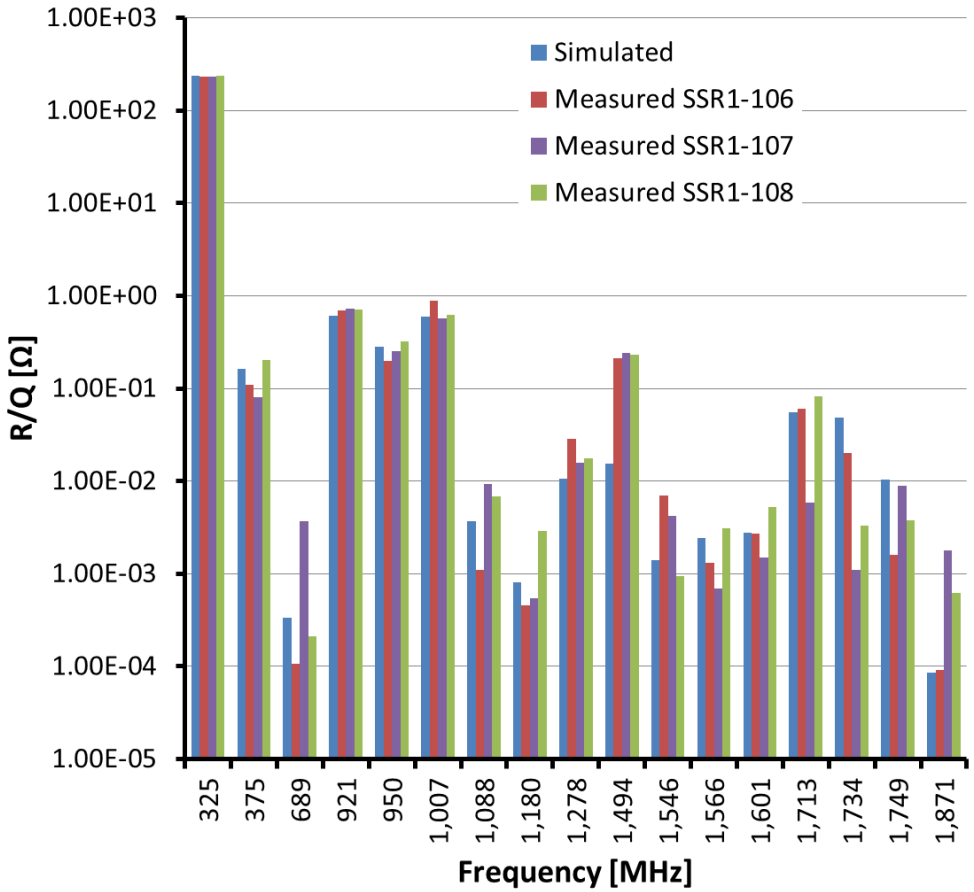
Measured Fundamental Mode Fields

- Field flatness is better than 93%
- Frequency shift from simulated values is within 1 MHz



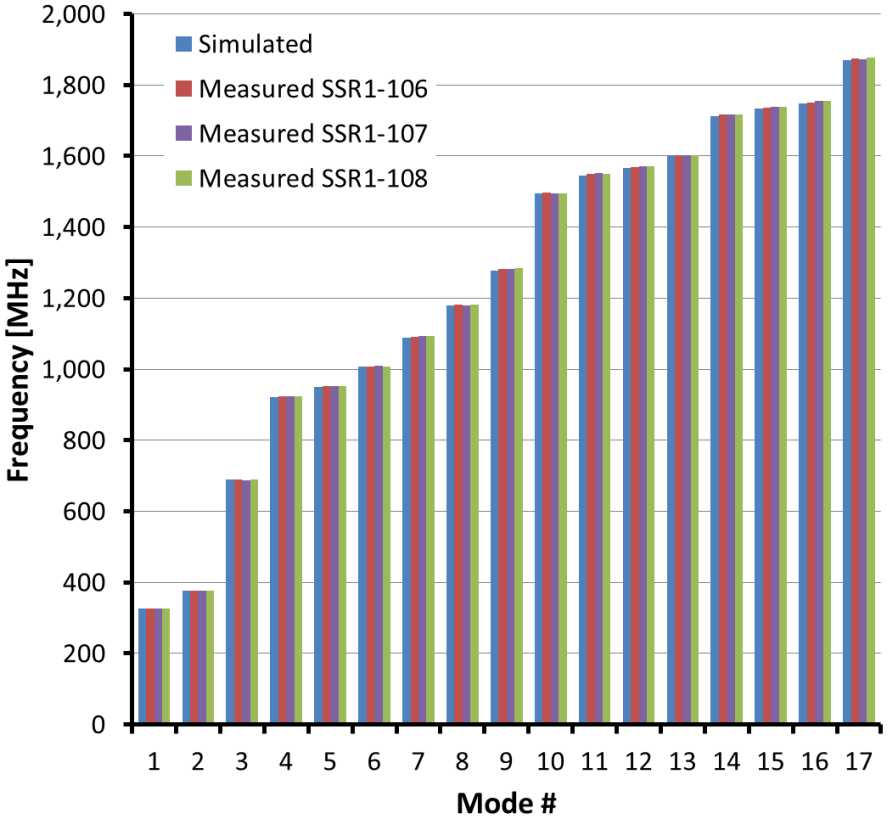
SSR1-	Freq [MHz]	Flatness	Freq Shift [KHz]
105	325.246	93%	-89
106	325.918	96%	583
107	326.266	100%	931
108	325.509	98%	174

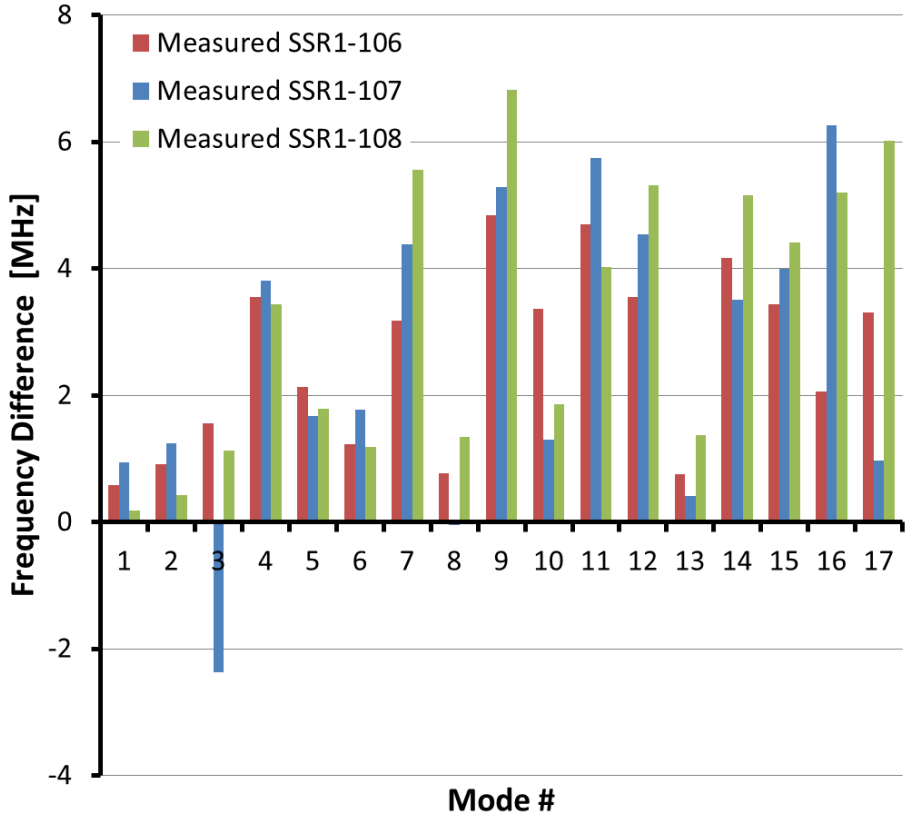
Measured R/Q for Monopoles



- Measured R/Q of the fundamental mode for the different measured cavities are in good agreement with the simulated values
- Measured R/Q of the HOM monopoles are < 1 Ω

Measured Resonant Frequencies for Monopoles





- Maximum frequency difference between simulated and measured resonant frequencies is < 7MHz